We claim:

1. A method for processing a signal received from a dispersive channel using a reduced complexity sequence estimation technique, said channel having a channel memory, said method comprising the steps of:

precomputing branch metrics for each possible value of said channel memory;

selecting one of said precomputed branch metrics based on past decisions from corresponding states; and

selecting a path having a best path metric for a given state.

2. The method of claim 1, wherein said precomputed branch metrics for a transition from channel assignment $\tilde{\alpha}$ under input a_n is given by:

$$\tilde{\lambda}_n(z_n, a_n, \tilde{\alpha}) = (z_n - a_n + \tilde{u}(\tilde{\alpha}))^2 .$$

where an intersymbol interference estimate for a particular channel assignment $\tilde{\alpha} = (\tilde{a}_{n-L}, \ldots, \tilde{a}_{n-1})$ can be obtained by evaluating the following equation:

$$\tilde{u}(\tilde{\alpha}) = -\sum_{i=1}^{L} f_i \tilde{a}_{n-i} .$$

3. The method of claim 1, wherein said path metric is an accumulation of said corresponding branch metrics over time.

4. The method of claim 1, wherein an appropriate branch metrics $\lambda_n(z_n, a_n, \rho_n)$ is selected from said precomputed branch metrics $\tilde{\lambda}_n(z_n, a_n, \tilde{\alpha})$ using the survivor path $\hat{\alpha}_n(\rho_n)$:

$$\lambda_n(z_n, a_n, \rho_n) = sel\{\Lambda_n(z_n, a_n, \rho_n), \hat{\alpha}_n(\rho_n)\}.$$

where $\Lambda_n(z_n, a_n, \rho_n)$ is a vector containing the branch metrics $\tilde{\lambda}_n(z_n, a_n, \tilde{\alpha})$, which can occur for a transition from state ρ_n under input a_n for different channel assignments $\tilde{\alpha}$ and $\hat{\alpha}_n(\rho_n)$ is the survivor sequence leading to state ρ_n.

5. The method of claim 1, wherein said best path metric is a minimum or maximum path metric.

6. The method of claim 1, wherein said reduced complexity sequence estimation technique is a reduced state sequence estimation (RSSE) technique.

7. The method according to claim 6, wherein said reduced state sequence estimation (RSSE) technique is a decision-feedback sequence estimation (DFSE) technique.

8. The method according to claim 6, wherein said reduced state sequence estimation (RSSE) technique is a parallel decision-feedback equalization (PDFE) technique.

9. The method of claim 1, wherein said reduced complexity sequence estimation technique is an implementation of the Viterbi algorithm.

10. The method of claim 1, wherein said reduced complexity sequence estimation technique is an implementation of the M algorithm.

11. The method of claim 1, wherein said past decisions from corresponding states are based on past symbols from a corresponding survivor path cell (SPC).

12. The method of claim 1, wherein said past decisions from corresponding states are based on past decisions from a corresponding add-compare-select cell (ACSC).

13. A method for processing a multi-dimensional trellis code signal received from a dispersive channel using a reduced complexity sequence estimation technique, said channel having a channel memory, said method comprising the steps of:

precomputing a one-dimensional branch metric for each possible value of said channel memory and for each dimension of the multi-dimensional trellis code;

selecting one of said precomputed one-dimensional branch metric based on past decisions from corresponding states; and

combining said selected one-dimensional branch metrics to obtain a multi-dimensional branch metric.

14. The method of claim 13, wherein said one-dimensional branch metric in the dimension j is precomputed by evaluating the following expressions:

$$\tilde{\lambda}_{n,j}\left(z_{n,j},a_{n,j},\tilde{\alpha}_j\right)=\left(z_{n,j}-a_{n,j}+\tilde{u}_j\left(\tilde{\alpha}_j\right)\right)^2 \text{ and } \tilde{u}_j\left(\tilde{\alpha}_j\right)=-\sum_{i=1}^{L} f_{i,j}\tilde{a}_{n-i,j}\ ,$$

where $\tilde{\alpha}_j=\left(\tilde{a}_{n-L,j},..,\tilde{a}_{n-1,j}\right)$ is a particular assignment for the channel state $\alpha_j=\left(a_{n-L,j},..,a_{n-1,j}\right)$ in dimension j.

15. The method of claim 13, wherein said selection of an appropriate one-dimensional branch metrics for further processing with a reduced complexity sequence estimator is given by:

$$\lambda_{n,j}\left(z_{n,j},a_{n,j},\rho_n\right)=sel\left\{\Lambda_{n,j}\left(z_{n,j},a_{n,j}\right),\hat{\alpha}_{n,j}(\rho_n)\right\}$$

where $\Lambda_{n,j}\left(z_{n,j},a_{n,j}\right)$ is the vector containing possible one-dimensional branch metrics $\tilde{\lambda}_{n,j}\left(z_{n,j},a_{n,j},\tilde{\alpha}_j\right)$ under input $a_{n,j}$ for different one-dimensional channel assignments $\tilde{\alpha}_j$ and $\hat{\alpha}_{n,j}(\rho_n)$ is the survivor sequence in dimension j leading to state ρ_n.

16. The method of claim 13, wherein said past decisions from corresponding states are based on past symbols from a corresponding survivor path cell (SPC).

17. The method of claim 13, wherein said past decisions from corresponding states are based on past decisions from a corresponding add-compare-select cell (ACSC).

18. A method for processing a multi-dimensional trellis code signal received from a dispersive channel using a reduced complexity sequence estimation technique, said channel having a channel memory, said method comprising the steps of:

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precomputing a one-dimensional branch metric for each possible value of said channel memory and for each dimension of the multi-dimensional trellis code;

combining said one-dimensional branch metric into at least two-dimensional branch metrics; and

selecting one of said at least two-dimensional branch metrics based on past decisions from corresponding states.

19. The method of claim 18, wherein said one-dimensional branch metric in the dimension j is precomputed by evaluating the following expressions:

$$\tilde{\lambda}_{n,j}\left(z_{n,j}, a_{n,j}, \tilde{\alpha}_j\right) = \left(z_{n,j} - a_{n,j} + \tilde{u}_j\left(\tilde{\alpha}_j\right)\right)^2 \text{ and } \tilde{u}_j\left(\tilde{\alpha}_j\right) = -\sum_{i=1}^{L} f_{i,j}\tilde{a}_{n-i,j} \text{ ,}$$

where $\tilde{\alpha}_j = \left(\tilde{a}_{n-L,j}, \ldots, \tilde{a}_{n-1,j}\right)$ is a particular assignment for the channel state $\alpha_j = \left(a_{n-L,j}, \ldots, a_{n-1,j}\right)$ in dimension j.

20. The method of claim 18, wherein said selection of an appropriate at least two-dimensional branch metrics corresponding to a particular state and input for further processing with a reduced complexity sequence estimator is based on the survivor symbols for said state and said at least two dimensions and said selection is performed among all precomputed at least two-dimensional branch metrics for said state, input and different channel assignments for said dimensions.

21. The method of claim 18, wherein said past decisions from corresponding states are based on past symbols from a corresponding survivor path cell (SPC).

22. The method of claim 18, wherein said past decisions from corresponding states are based on past decisions from a corresponding add-compare-select cell (ACSC).

23. The method of claim 18, further comprising the step of combining said selected at least two-dimensional branch metric to obtain a multi-dimensional branch metric.

24. A method for processing a signal received from a dispersive channel using a reduced complexity sequence estimation technique, said channel having a channel memory, said method comprising the steps of:

prefiltering said signal to shorten said channel memory;

precomputing branch metrics for each possible value of said shortened channel memory;

selecting one of said precomputed branch metrics based on past decisions from corresponding states; and

selecting a path having a best path metric for a given state.

25. The method of claim 24, wherein said prefiltering step further comprises the step of processing less significant taps with a lower complexity cancellation algorithm that cancels the less significant taps using tentative decisions and processing more significant taps with a reduced state sequence estimation (RSSE) technique.

26. The method according to claim 24, wherein said lower complexity cancellation algorithm is a decision feedback prefilter (DFP) technique.

27. The method according to claim 24, wherein said lower complexity cancellation algorithm utilizes a linear equalizer technique.

28. The method according to claim 24, wherein said lower complexity cancellation algorithm is a soft decision feedback prefilter (DFP) technique.

29. The method according to claim 24, wherein said lower complexity cancellation algorithm reduces the intersymbol interference associated with said less significant taps.

30. The method according to claim 24, wherein said more significant taps comprise taps below a tap number, U, where U is a prescribed number less than L.

31. The method according to claim 24, wherein said reduced complexity sequence estimation technique is a decision-feedback sequence estimation (DFSE) technique.

32. The method according to claim 24, wherein said reduced complexity sequence estimation technique is a parallel decision-feedback equalization (PDFE) technique.

33. The method according to claim 24, wherein said reduced complexity sequence estimation technique is a reduced state sequence estimation (RSSE) technique.

34. The method according to claim 24, wherein said reduced complexity sequence estimation technique is an implementation of the Viterbi algorithm.

35. The method according to claim 24, wherein said reduced complexity sequence estimation technique is an implementation of the M algorithm.

36. The method of claim 24, wherein said past decisions from corresponding states are based on past symbols from a corresponding survivor path cell (SPC).

37. The method of claim 24, wherein said past decisions from corresponding states are based on past decisions from a corresponding add-compare-select cell (ACSC).

38. A method for processing a signal received from a dispersive channel using a reduced complexity sequence estimation technique, said channel having a memory, said method comprising the steps of:

prefiltering said signal to shorten said channel memory;

precomputing a one-dimensional branch metric for each possible value of said shortened channel memory and for each dimension of the multi-dimensional trellis code;

combining said one-dimensional branch metric into at least two-dimensional branch metrics; and

selecting one of said at least two-dimensional branch metrics based on past decisions from corresponding states.

39. A hybrid survivor memory architecture for a reduced complexity sequence estimator for a channel having a channel memory of length *L*, comprising:

a register exchange architecture (REA) for storing the survivors corresponding to the *L* past decoding cycles; and

a trace-back architecture (TBA) for storing survivors corresponding to later decoding cycles, wherein symbols moved from said register exchange architecture (REA) to said trace-back architecture (TBA) are mapped to information bits.

40. The survivor memory architecture of claim 39, wherein said reduced complexity sequence estimation technique is a reduced state sequence estimation (RSSE) technique.

41. The survivor memory architecture of claim 39, wherein said reduced complexity sequence estimation technique is an implementation of the Viterbi algorithm.

42. The survivor memory architecture of claim 39, wherein said reduced complexity sequence estimation technique is an implementation of the M algorithm.

43. A hybrid survivor memory architecture for a reduced complexity sequence estimator for a channel having a channel memory of length *L*, comprising:

a first register exchange architecture (REA) for storing the survivors corresponding to the *L* past decoding cycles; and

a second register exchange architecture (REA) for storing survivors corresponding to later decoding cycles, wherein symbols moved from said first register exchange architecture (REA) to said second register exchange architecture (REA) are mapped to information bits.

44. The survivor memory architecture of claim 43, wherein said reduced complexity sequence estimation technique is an reduced state sequence estimation (RSSE) technique.

45. The survivor memory architecture of claim 43, wherein said reduced complexity sequence estimation technique is an implementation of the Viterbi algorithm.

46. The survivor memory architecture of claim 43, wherein said reduced complexity sequence estimation technique is an implementation of the M algorithm.

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47. A reduced complexity sequence estimator for processing a signal received from a dispersive channel having a channel memory, comprising:

a look-ahead branch metrics unit for precomputing branch metrics for each possible value of said channel memory;

a multiplexer for selecting one of said precomputed branch metrics based on past decisions from corresponding states; and

an add-compare-select unit for selecting a path having a best path metric for a given state.

48. The reduced complexity sequence estimator of claim 47, wherein said past decisions from corresponding states are based on past symbols from a corresponding survivor path cell (SPC).

49. The reduced complexity sequence estimator of claim 47, wherein said past decisions from corresponding states are based on past decisions from a corresponding add-compare-select cell (ACSC).

50. A reduced complexity sequence estimator for processing a signal received from a dispersive channel having a channel memory, comprising:

a look-ahead branch metrics unit for precomputing a one-dimensional branch metric for each possible value of said channel memory and for each dimension of the multi-dimensional trellis code;

a multiplexer for selecting one of said precomputed one-dimensional branch metric based on past decisions from corresponding states; and

a multi-dimensional branch metric cell for combining said selected one-dimensional branch metrics to obtain a multi-dimensional branch metric.

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51. The reduced complexity sequence estimator of claim 50, wherein said past decisions from corresponding states are based on past symbols from a corresponding survivor path cell (SPC).

52. The reduced complexity sequence estimator of claim 50, wherein said past decisions from corresponding states are based on past decisions from a corresponding add-compare-select cell (ACSC).

53. A reduced complexity sequence estimator for processing a signal received from a dispersive channel having a channel memory, comprising:

a look-ahead branch metrics unit for precomputing a one-dimensional branch metric for each possible value of said channel memory and for each dimension of the multi-dimensional trellis code;

means for combining said one-dimensional branch metric into at least two-dimensional branch metrics;

a multiplexer for selecting one of said at least two-dimensional branch metrics based on past decisions from corresponding states; and

a multi-dimensional branch metric cell for combining said selected at least two-dimensional branch metric to obtain a multi-dimensional branch metric.

54. The reduced complexity sequence estimator of claim 53, wherein said past decisions from corresponding states are based on past symbols from a corresponding survivor path cell (SPC).

55. The reduced complexity sequence estimator of claim 53, wherein said past decisions from corresponding states are based on past decisions from a corresponding add-compare-select cell (ACSC).

56. A reduced complexity sequence estimator for processing a signal received from a dispersive channel having a channel memory, comprising:

a prefilter to shorten said channel memory;

a look-ahead branch metrics unit for precomputing branch metrics for each possible value of said channel memory;

a multiplexer for selecting one of said precomputed branch metrics based on past decisions from corresponding states; and

an add-compare-select unit for selecting a path having a best path metric for a given state.

57. The reduced complexity sequence estimator of claim 56, wherein said past decisions from corresponding states are based on past symbols from a corresponding survivor path cell (SPC).

58. The reduced complexity sequence estimator of claim 56, wherein said past decisions from corresponding states are based on past decisions from a corresponding add-compare-select cell (ACSC).

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59. A reduced complexity sequence estimator for processing a signal received from a dispersive channel having a channel memory, comprising:

a prefilter to shorten said channel memory;

a multi-dimensional look-ahead branch metrics unit for precomputing a one-dimensional branch metric for each possible value of said shortened channel memory and for each dimension of the multi-dimensional trellis code;

means for combining said one-dimensional branch metric into at least two-dimensional branch metrics; and

a multiplexer for selecting one of said at least two-dimensional branch metrics based on past decisions from corresponding states.